

### Remarks

The above Amendments and these Remarks are in reply to the Final Office Action mailed June 4, 2007. A Petition for Extension of Time to Respond is submitted herewith, together with the appropriate fee.

Claims 1-29 and 34 were pending in the Application prior to the outstanding Office Action. In the Office Action, the Examiner reviewed and accepted the Terminal Disclaimer. Applicant appreciates the acceptance of the Terminal Disclaimer. The Examiner rejected claims 1-29 and 34. The present Reply cancels claims 7 and 13 and amends claims 1-3, 5, 6, 9-12, 15-19 and 34, leaving for the Examiner's present consideration claims 1-6, 8-12, 14-29 and 34. Reconsideration of the rejections is requested.

#### I. Claim Rejections -- 35 USC § 102

Claims 1-14, 18, 20, 22-26, 28, 29 and 34 stand rejected under 35 U.S.C. 102(e) as being anticipated by *Imahashi* (US Patent No. 6,284,668). Applicant requests cancellation of claims 7 and 13. Applicant respectfully traverses the rejection of claims 1-6, 8-12, 14, 18, 20, 22-26, 28, 29 and 34.

The Examiner writes that “*Imahashi* teaches generating a plasma discharge from argon or a mixture of argon and a reactive gas that serves as an etchant.” See OA, page 3. However, *Imahashi* fails to disclose a plasma torch “having an outer tube to communicate a plasma gas to a distal end...and an inner tube nested within the outer tube...introducing the reactive precursor to the plasma discharge through the inner tube to generate a reactive species” as recited in claim 1 and 34.

As can be seen in FIGS. 1-3 of *Imahashi*, the etchant 26 and inactive gas 28 are delivered to a common plasma chamber 22 where they mix. The combined process gasses are inductively coupled to generate a plasma. Referring to col. 4, lines 56-67, *Imahashi* teaches

“The plasma generator 20 generates a plasma by using high-frequency inductive coupling. At this time, a process gas 32 such as an inactive gas and an etchant gas is flowed through the plasma chamber 22...A high frequency of, e.g., 13.56 MHz is applied to the antenna (induction coil) 24. Due to this high frequency, an alternating magnetic field as indicated by dotted lines 34 in FIG. 3 is generated so that electric fields 36 are generated around the magnetic fluxes and electrons are accelerated. The electrons accelerated **at this time collide with the atoms of the process gas 32 to cause plasma discharge.**”

The methods taught by *Imahashi*, however, can cause damage to the plasma chamber 22 in which the etchant 26 and inactive gas 28 are delivered. As recited in paragraphs [0045] and [0046] of the Specification of the present invention:

“The outer tube can handle the bulk of the plasma gas, while the inner tube can be used to inject the reactive precursor...a simple way to introduce the reactive gas, or a material to be deposited, is through the center....

Injecting the reactive precursor into the center of the excitation zone has several important advantages over other techniques. Some atmospheric plasma jet systems, such as ADP, mix the precursor gas in with the plasma gas, creating a uniform plume of reactive species. This exposes the electrodes or plasma tubes to the reactive species, leading to erosion and contamination of the plasma....In contrast, the reactive species in the RAP system are enveloped by a sheath of argon, which not only reduces the plasma torch erosion but also reduces interactions between the reactive species and the atmosphere.”

*Imahashi* fails to disclose all of the features of claims 1 and 34 because *Imahashi* fails to disclose a plasma torch “having an outer tube to communicate a plasma gas to a distal end...and an inner tube nested within the outer tube...introducing the reactive precursor to the plasma discharge through the inner tube to generate a reactive species” as recited in claim 1 and 34. Therefore, *Imahashi* cannot anticipate claims 1 and 34 under 35 U.S.C. 102(e).

Dependent claims have at least the features of the independent claims from which they depend; therefore, *Imahashi* fails to disclose all of the features of claims 2-6, 8-12, 14, 18, 20, 22-26, 28, 29 (which ultimately depend from claim 1) under 35 U.S.C. 102(e).

## **II. Claim Rejections – 35 USC § 103**

1. Claims 15-17 and 19 stand rejected under 35 U.S.C. 103(a) as being unpatentable over *Imahashi* as applied to Claim 1 above and further in view of *Selitsner* (US Patent No. 6,218,640). Applicant respectfully traverses the rejection.

For the reasons given above in Section I, *Imahashi* fails to teach or suggest all of the features of claim 1. *Selitsner* fails to remedy this deficiency. Referring to FIG. 2A of *Selitsner*, an inductive plasma torch is taught having a central channel 21 nested within an intermediate tube 20 which is surrounded by an induction coil 22. The plasma gas is delivered to the induction coil by way of the central channel 21 (“The central (plasma) gas is chosen to be applicable for plasma processing” col. 6, lines 15-16.) The intermediate tube 20 surrounding the central channel 21 is provided so that “very high, cooling (sheath) gas is injected between the inside 21 and plasma confined 20 tubes” See col. 5, lines 64-66.

Referring to FIG. 6 of *Selitser*, another inductive plasma torch is taught having a central channel 21 nested within an intermediate tube 20 which is surrounded by an induction coil 22. However, *Selitser* describes this plasma torch similarly, disclosing that “Gas flow between the inner and outer tubes provides cooling for the quartz tube in the plasma region.” See col. 8, lines 53-55.

The plasma torch disclosed in *Selitser* does not teach or suggest a plasma torch “having an outer tube to communicate a plasma gas to a distal end...and an inner tube nested within the outer tube...introducing the reactive precursor to the plasma discharge through the inner tube to generate a reactive species” as recited in claim 1; therefore, *Imahashi* in view of *Selitser* cannot render claim 1 obvious under 35 U.S.C. 103(a).

Dependent claims include all the features of the independent claim from which they depend; therefore, *Imahashi* in view of *Selitser* cannot render claim 19 (which depends from claim 1) obvious under 35 U.S.C. 103(a).

Claim 15 further recites “an intermediate tube arranged between the outer tube and the inner tube...introducing an auxiliary gas into the intermediate tube.” Referring to FIG. 1 of the present application and the above discussion, the auxiliary gas is injected to the plasma discharge from a tube between the outer (plasma) tube and the inner tube. *Selitser* teaches providing a cooling (sheath) gas between the inside tube 21 and the intermediate tube 20. Thus, the cooling gas surrounds the plasma to protect the intermediate tube.

Referring to paragraph [0047] of the Specification of the present invention, “The auxiliary gas can have at least two functions. First, the gas can keep the hot plasma **away from the inner tube**, since even brief contact may seal the inner tube shut. Second, the gas can be used **to adjust the position of the discharge** in space.”

Because *Imahashi* in view of *Selitser* fails to teach “an intermediate tube arranged between the outer tube and the inner tube...introducing an auxiliary gas into the intermediate tube,” *Imahashi* in view of *Selitser* cannot render claim 15 obvious under 35 U.S.C. 103(a).

Dependent claims include all the features of the independent claim from which they depend; therefore, *Imahashi* in view of *Selitser* cannot render claims 16 and 17 (which depends from claim 15, and ultimately from claim 1) obvious under 35 U.S.C. 103(a).

2. Claims 17, 19 and 21 stand rejected under 35 U.S.C. 103(a) as being unpatentable over *Imahashi* as applied to Claim 1 above and further in view of *Fabel* (US Patent No. 4,674,683). Applicant respectfully traverses the rejection.

For the reasons given above in Section I, *Imahashi* fails to teach or suggest all of the features of claim 1. *Fabel* fails to remedy the deficiencies. The Examiner recites *Fabel* as teaching introducing a plasma gas tangentially and the temperature of plasma processes. However, nowhere does *Fabel* teach or suggest a plasma torch “having an outer tube to communicate a plasma gas to a distal end...and an inner tube nested within the outer tube...introducing the reactive precursor to the plasma discharge through the inner tube to generate a reactive species” as recited in claim 1.

Dependent claims include all the features of the independent claim from which they depend; therefore, *Imahashi* in view of *Fabel* cannot render claims 17, 19 and 21 (which ultimately depend from claim 1) obvious under 35 U.S.C. 103(a).

3. Claim 27 stands rejected under 35 U.S.C. 103(a) as being unpatentable over *Imahashi* as applied to Claim 1 above and further in view of *Siniaguine et al.* (US Patent No. 6,105,534). Applicant respectfully traverses the rejection.

For the reasons given above in Section I, *Imahashi* fails to teach or suggest all of the features of claim 1. *Siniaguine* fails to remedy the deficiencies. The Examiner recites *Siniaguine* as teaching a plasma torch with a multiple head. However, nowhere does *Siniaguine* teach or suggest a plasma torch “having an outer tube to communicate a plasma gas to a distal end...and an inner tube nested within the outer tube...introducing the reactive precursor to the plasma discharge through the inner tube to generate a reactive species” as recited in claim 1.

Dependent claims include all the features of the independent claim from which they depend; therefore, *Imahashi* in view of *Siniaguine* cannot render claim 27 (which depends from claim 1) obvious under 35 U.S.C. 103(a).

### III. Conclusion

In light of the above, it is respectfully submitted that all of the claims now pending in the subject patent application should be allowable, and a Notice of Allowance is requested. The Examiner is respectfully requested to telephone the undersigned before an advisory action is issued in order to avoid any unnecessary filing of an appeal.

Enclosed is a PETITION FOR EXTENSION OF TIME UNDER 37 C.F.R. § 1.136 for extending the time to respond up to and including today, October 18, 2007.

The Commissioner is authorized to charge any underpayment or to credit any overpayment to Deposit Account No. 06-1325 for any matter in connection with this response, including any fee for extension of time, which may be required.

Respectfully submitted,

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Date: October 19, 2007

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